Pick Your Pattern

Reporting Category Patterns, Functions, and Algebra

Topic Describing and expressing relationships found in number patterns

Primary SOL 5.17 The student will describe the relationship found in a number pattern and express the relationship.

Materials

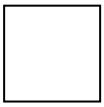
- Toothpicks
- T-table

Vocabulary

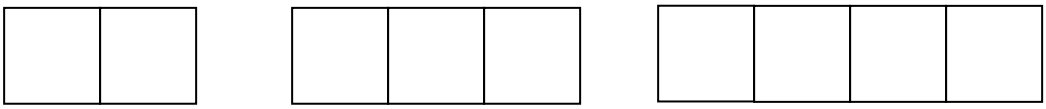
input, output

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Give each student a blank sheet of paper and toothpicks.
2. Have students make a square out of the fewest possible toothpicks and record the data on the paper.



3. Show them the next three terms in the sequence.



4. Have the students form the three terms and create a T-table.

Number of squares	Number of toothpicks
1	4
2	7
3	10
4	13

5. Have students determine the function machine's rule by looking at the number pattern recorded in the T-table: the number of squares recorded are the input, and the number of toothpicks recorded are the output, e.g., $(n \times 3) + 1$.
6. Then have students use their rule to determine how many toothpicks would be needed to make five connected boxes.
7. Have the students make the figure with five boxes and count to see if their rule worked. If not, they need to formulate a new rule.
8. Students should then test the rule for six squares. Ask students, "Would the rule be the same if the squares were attached in a different way?"

9. Have students experiment with different designs, such as a staircase, to see if they can use their old rule or if they must formulate a new rule.
10. Let students experiment with different formations.

Assessment

- **Questions**
  - What happened to the pattern when you used a different formation? Did the rule change? Why, or why not?
  - How would the pattern change if you did not have the squares connect to each other?
- **Journal/Writing Prompts**
  - Relate the pattern to the toothpicks in more than one way.
  - Explain the difference between a repeating pattern and a growing pattern. Give an example of each.
- **Other**
  - Have students use colored tiles to make a letter; for example, the letter T can be constructed with three tiles across the top and three tiles going down the center. Have students record this on a T-chart with "stage one" in the first column and the number of tiles in the second column. Then, have students make their Ts larger by adding tiles, and have them record the number of tiles added as stage two on the T-chart. Have students continue to add and record the stage and number of tiles. Then ask the students to write the rule for their pattern using a variable.
  - Have students work in pairs. They should each write a rule and give it to their partner. The partner then uses numbers to create a pattern using that rule.

Extensions and Connections (for all students)

- Have students experiment with triangles, hexagons, or other shapes.
- **Guess My Rule.** Have students take turns giving the teacher a number to "input" on an input-output T-table. Using a predetermined rule, write the appropriate "output" number in the table. Next, provide an input number and ask a student who thinks he/she knows the rule being followed to determine the output—but do not allow the student to say the rule aloud. The student will prove that he/she knows the rule by being able to give the correct output. When most of the students seem to know the rule, have the students state the rule to the rest of the class.

Strategies for Differentiation

- Using pattern blocks and tiles, students can create multiple patterns and draw pictures of the stages.